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ORANGES NOT A SUBSTITUTE FOR MILK.

By M. E. JAFFA, M. S., Consulting Nutrition Expert, California State Board of Health.

In the issue of the WEEKLY BULLETIN for January 5th, last, there appears an article entitled "Oranges vs. Milk for the School Lunch," referring to a paper by Miss Margaret S. Chaney, published October, 1923, in the American Journal of the Diseases of Children and reviewed editorially in the Journal of the American Medical Association for December 29, 1923.

In view of the fact that so many questions have been asked with reference to this article it would seem pertinent to present some comments, in order that there shall be no misunderstanding in the mind of the layman.

The statement in the article which has given rise to considerable confusion and misconception is:

"It would appear, however, that oranges may produce as beneficial results as milk in the promotion of growth and weight."

In other words, there are those who have, therefore, concluded, as indicated by their questions, that oranges may be considered as a substitute for milk. It should be stated at the outset that this is not true, but that they should both be classed as supplemental foods and in order to properly and comprehensively understand this matter it is necessary to discuss separately the nutritional worth of the two foods and then make the comparison.

In accordance with the rulings and opinions of the Bureau of Chemistry, U. S. Department of Agriculture, no food or food product can be considered as a substitute for milk unless said food or food product possesses the nutritional properties of milk. The question is,

then, do oranges possess these properties of milk?

The evaluation of a food to the body depends on (1) its potency as a tissue builder, (2) its availability as a source of energy, (3) its ability to regulate the body processes.

Some foods like lean meat are rich in tissue building properties, others, such as rice and the cereals, are most excellent sources of energy.

If the different ingredients or nutrients which make up our foods had the same value for promoting growth and development of the young then it could be said that oranges might be a substitute for milk, in that the percentage of *total* nutrients in the two foods differ but little. It has long been known, however, that each nutrient of a food not only has its specific function and duty to perform in the body, but, that the *same* nutrient in different foods will vary as to the respective value for growth promoting purposes and it is in this respect that milk outshines every other food.

Growing Child Needs Protein.

It is absolutely essential for a growing child that it receive protein or nitrogenous compounds, rich in special amino acids or units of structure, easily digested and assimilated. There is no one food which, in this respect, is ahead of milk, and for the very young child no food equal to it. For the older individual milk may be replaced in part by meat and eggs. For promoting growth and development in the young, the animal proteins, such as those of milk, meat and eggs, are far more valuable

than the vegetable. The coefficient of digestion for these animal proteins is 97 per cent, while the corresponding figure for fruit protein is only 85. Furthermore, fruit protein alone is inadequate for growth and development. It is thus seen that orange protein could not be considered as a substitute for milk protein in the food of the child.

It goes without saying that it is unnecessary to dwell upon the comparative values of the fat content of the two foods. The amount found in oranges is almost negligible, while that of milk constitutes almost 25 per cent of the total solids in milk, and, furthermore, there is no substitute, dietetically, for milk fat or butter owing to its richness in vitamin A. It is true that egg yolk fat has a high nutritional value, but it is not as available as butter.

With reference to vitamins in general it may be said that three facts must be accepted:

1. There are 3 types of vitamins, A or antirachitic, B or antineuritic, and C or antiscorbutic. A being soluble in fat and B and C soluble in water.

2. Vitamins are unidentified dietary essentials, therefore,

3. No diet can be complete without them.

All these three types of vitamins are essential for growth, and the maintenance of normal condition in the adult. Each also has its separate function in the body with reference to prevention of certain deficiency diseases, A for the prevention of rickets, B for the prevention of beriberi and kindred diseases and C for the prevention of scurvy.

The natural foods, milk, eggs, meat, fruits and vegetables, are by far the best source of these vitamins, not the proprietary products so well advertised, in colored headlines and variegated cuts, in the daily press.

When comparing the carbohydrates of the two foods it will be observed that the orange is far richer than milk and if carbohydrates only were to be considered in discussing the value of a food, nutritionally, then oranges would outrank milk. But, while the carbohydrates are necessary they are far from being the main consideration.

Mineral in Diet Necessary.

Some years ago it was not considered vitally necessary to devote any particular attention to the content of mineral matter in the diet. It was thought that any diet would contain sufficient quantity of the mineral elements to satisfy the requirements of the body. It is a little more than a decade since the first comprehensive bulletin on the subject of the importance of mineral elements in nutrition was published. Since that time more and more attention has been given

to this subject, with the result that a fuller realization and appreciation of the mineral elements in the diet has been brought about.

Furthermore, it has been found by most careful and comprehensive investigations that it is a question of quality and not of quantity and it is for this reason that not only is it necessary to know the percentage of mineral matter in a food but the *nature* of that mineral matter. In other words, two foods might have identically the same percentage of mineral matter and yet be diametrically opposite as far as biological worth or nutritional value is concerned. This is well illustrated in the case of oranges and flour. The percentage of ash or minerals in the last named foods are identically the same (five-tenths of one per cent). The nature or quality, however, of the mineral matter in the respective foods is absolutely different. In the flour there is the predominance of the acid-forming minerals, while in the orange we find exactly the opposite and basic-forming minerals, potash predominating. It may be said that it is this basic character of the minerals in oranges and other fruits which renders them so valuable and at the same time so necessary to maintain the proper equilibrium of the body as far as the mineral element is concerned.

It is a well known fact that, in planning the food for the young and growing animal, one of the first considerations is the supplying of material for the growth and development of the bones the main ingredient of which is calcium phosphate. If the food does not contain sufficient amount of available calcium and phosphorus, and also of the vitamins necessary for the adequate assimilation of these two minerals there will result a poorly developed skeleton and consequently a poorly developed body, in that the full development of the bones is the first essential of a normal body.

Analyses show that milk is 40 per cent richer than the orange in *total* amount of ash. This figure, however, does not tell the whole tale, in that the milk ash is rich in bone-forming minerals containing, per unit weight, between two and three times as much lime and about four times as much phosphorus as is shown for the orange. It is of interest, in passing, to note that there is no one food so adequate for bone building as milk. This is due not only to the high calcium content in the ash of milk but also to the fact that milk is such a potent source of vitamin A, the presence of which is vitally necessary for the optimum assimilation of calcium. It has been proven that in the absence of vitamin A there will not be an adequate assimilation by

the body of calcium, even though there be a generous supply of this mineral in the diet.

It is obvious, then, that the nutritional value of oranges and milk differ radically, biologically, in their respective content of fat, protein, and minerals; thus proving conclusively that oranges can not be considered as a substitute for milk for the purposes of growth and development of the young.

Again, milk can not be considered as a substitute for the orange in discussing the respective content of vitamin C, in that milk is at best not rich in this dietary essential, and under certain conditions may be absolutely deficient in this respect, while exactly the reverse is true of the orange.

Orange an Important Food.

It must not be inferred from the foregoing that the orange is not a most important food—far from it. In the issue of the WEEKLY BULLETIN, California State Board of Health, under date of June 3, 1922, appears an article entitled "Eat More Fruit." It is there pointed out that fruits, and especially the orange and other citrus fruits, are most excellent foods.

Both Are Supplemental Foods.

It might be asked how, then, in the light of the foregoing, do oranges and milk compare in food value? The answer to this question is that they are, in every sense of the word, supplemental foods—not substitutional ones. They are supplemental in that one helps to make good the deficiencies of the other. Milk, particularly pasteurized milk, is more or less deficient in vitamin C. The orange, it has just been shown, in one of our best sources of this vitamin. Again, the mineral matter in the orange effectively adds to the body a supply of minerals so necessary to maintain the proper condition of the blood stream. Furthermore, the orange, with its 12 per cent of sugar, helps in no small way to increase the energy value of the combination.

Milk, on the other hand, owing to:

1. Its most valuable fat content,
2. Its richness in protein of the highest biological type, and
3. Its being such a highly important and adequate source of essential minerals for growth and repair,

renders it a most timely addition to the orange which is poor in protein and fat and far different in its mineral content.

In this connection it may be asked, "Are there any conditions, under which oranges would produce as beneficial results as milk in the promotion of growth and weight?" The answer is, "Yes, there are such conditions." For example, if a group of children were

receiving sufficient milk for their respective body requirements, but their diet was deficient in fresh fruit and vegetables, then, naturally, the addition of more milk would still not meet the body needs; whereas, the addition of fruit, particularly orange, would supply the deficiencies of the diet and make for better health conditions.

This in fact is what happened in connection with the study, made by Miss Chaney, previously referred to, who very sensibly and truly writes:

"A comparison of the gains of the orange and milk groups is of interest. Oranges apparently are superior to milk as fed to the children involved in the test. As determined by the questionnaire, most of the children were receiving sufficient milk at home. On the other hand, oranges were used less plentifully; in many cases not at all. Therefore, the oranges fed at school supplemented the milk and caused more rapid gain."

The conclusion from such a finding is, however, far from indicating that oranges can be substituted for milk in the promotion of growth and weight; but clearly indicates the value of the orange as furnishing that which the milk lacks, in other words, being a supplemental food.

Two foods can be used interchangeably or substitutionally from a nutritional standpoint, only when they can replace each other in the diet. Take for example milk and orange. If 100 grams of milk were required for certain growth purposes, then 50 grams of milk plus 50 grams of orange would be equivalent for the purposes of growth to the 100 grams of milk, if the two foods had the same biological value. In view of the fact that such is not the case it would be doubtful if such a substitution would be advisable or desirable and this is specially true when considering the proteins. The orange protein does not rate as high, nutritionally, as does that of milk and, furthermore, the percentage of this ingredient in the orange is only about one-third of that recorded for milk.

Miss Chaney also very wisely says, "Further investigation using a group of children from a poor district, may show decidedly different results and will make an interesting study."

Such an investigation is urgently called for because in the poor districts as a rule children do not receive sufficient milk to satisfy the demands of growth and in such cases in all probability the milk would prove more beneficial than the orange.

Summary.

Summarizing the foregoing presentation it would appear:

1. That oranges and milk are both excellent and important foods and have

their respective places in a well balanced dietary.

2. Owing to the great difference, biologically, of the respective nutrients in milk and the orange they can not be considered as substitutes. Orange can not be classed as a substitute for milk, neither can milk be considered as a substitute for the orange.

3. Milk and oranges should be designated as supplemental foods, in that the deficiencies of one are supplied by the other.

MORBIDITY.*

Diphtheria.

326 cases of diphtheria have been reported, as follows: Los Angeles 81, San Francisco 91, Oakland 27, Los Angeles County 28, San Fernando 5, Glendale 8, Sacramento 10, Richmond 7, Bakersfield 7, Redondo Beach 1, Santa Barbara 1, Santa Monica 1, Petaluma 2, Berkeley 5, Santa Paula 2, Stockton 3, Burlingame 3, Kingsburg 3, Los Gatos 2, Orange County 1, Long Beach 4, Alhambra 1, El Monte 3, Whittier 2, Alameda 2, Hayward 1, Fillmore 4, Santa Ana 2, Sutter County 1, Kern County 1, Fresno County 2, Sonora 1, Stanislaus County 2, Santa Barbara County 1, Imperial County 1, Tulare County 1, Modesto 1, San Benito County 1, Fresno 2, Pasadena 5.

Measles.

472 cases of measles have been reported, as follows: San Francisco 128, Los Angeles 19, Berkeley 28, Alameda 30, Los Angeles County 10, Oakland 15, Hanford 6, Visalia 6, Burbank 12, Mendocino County 7, Sisson 5, San Mateo 18, San Jose 5, Ontario 6, Eureka 9, Palo Alto 7, Riverside 5, Merced County 5, Humboldt County 5, Merced 13, Alhambra 2, Long Beach 2, San Fernando 1, Mill Valley 3, Butte County 1, Santa Cruz County 1, Pomona 4, Modesto 4,

Redwood City 1, Stanislaus County 2, Piedmont 1, Redlands 1, Kern County 4, Sutter County 2, Chula Vista 1, Tulare County 3, Richmond 3, Colusa County 3, Colusa 1, Gilroy 1, Santa Cruz 1, Fresno County 3, San Benito County 3, Daly City 1, Glendale 1, Watsonville 1, Monterey County 4, San Joaquin County 1, Petaluma 1, Venice 2, Larkspur 2, Sacramento 4, Chico 3, Fresno 20, Pasadena 14, Willows 1, San Diego County 24, Oxnard 5, Elsinore 1.

Scarlet Fever.

343 cases of scarlet fever have been reported, as follows: Los Angeles 106, San Francisco 38, Los Angeles County 26, Fresno County 25, Oakland 16, Pomona 6, Glendale 5, Yolo County 6, Stanislaus County 5, Colusa County 5, Taft 7, Sanger 5, Long Beach 2, Barstow 2, Alhambra 2, Hawthorne 1, Huntington Park 1, Whittier 2, Berkeley 3, Alameda 3, Riverside 3, Tracy 1, Stockton 2, National City 1, Santa Barbara 2, San Bernardino County 2, Orange County 2, Selma 1, Porterville 1, Merced County 3, Red Bluff 3, San Mateo County 1, Coalinga 2, Ventura County 1, Ontario 2, Daly City 1, Chico 1, Richmond 1, Eldorado County 4, Napa 2, Piedmont 1, Kern County 4, Amador County 3, San Jose 2, Fresno 22, Pasadena 5, Petaluma 1, San Diego County 3.

Typhoid Fever.

4 cases of typhoid fever have been reported, as follows: Rialto 1, Los Angeles County 1, Napa County 1, California 1.

Smallpox.

344 cases of smallpox have been reported, as follows: Los Angeles 180, Los Angeles County 70, Long Beach 29, Compton 9, Pomona 13, Huntington Park 5, Santa Monica 11, Ontario 4, El Segundo 2, Redondo Beach 1, La Verne 1, Torrance 1, Orange County 2, Riverside 1, Inyo County 1, Sacramento 4, Santa Paula 1, Fillmore 1, Santa Clara 1, Pasadena 7.

*From reports received on January 21 and 22 for week ending January 19, 1924.

COMMUNICABLE DISEASE REPORTS.

	1923-1924			1922-1923			Reports for week ending Jan. 20 received by Jan. 23	
	Week ending			Reports for week ending Jan. 19 received by Jan. 22	Week ending			
	Dec. 29	Jan. 5	Jan. 12		Dec. 30	Jan. 6		
Anthrax	0	0	0	0	0	0	1	
Cerebrospinal Meningitis	0	0	3	4	1	3	0	
Chickenpox	113	223	463	313	82	167	151	
Diphtheria	315	285	322	326	201	157	209	
Dysentery (Bacillary)	1	0	0	0	7	0	0	
Epidemic Encephalitis	0	5	2	5	3	0	4	
Epidemic Jaundice	0	0	0	0	0	0	0	
Gonorrhoea	90	108	78	134	61	127	165	
Influenza	40	31	52	39	19	33	45	
Leprosy	0	0	0	0	1	0	0	
Malaria	6	0	1	2	2	1	3	
Measles	450	432	618	472	32	63	62	
Mumps	16	20	23	32	12	11	16	
Pneumonia	101	94	139	112	229	75	90	
Poliomyelitis	6	2	0	3	0	0	0	
Rabies (Human)	0	0	0	0	0	0	0	
Scarlet Fever	269	251	277	343	119	142	169	
Smallpox	143	152	233	344	14	25	28	
Syphilis	162	133	181	163	84	100	124	
Tuberculosis	172	127	231	155	159	162	154	
Typhoid Fever	8	5	13	4	11	9	13	
Typhus Fever	0	0	0	1	0	0	0	
Whooping Cough	10	28	51	40	52	85	123	
Totals	1902	1896	2687	2492	1089	1160	1357	
							1082	